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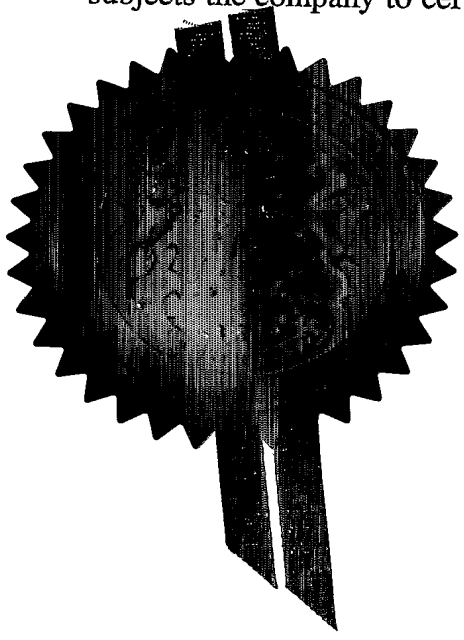

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| 2. | Patent Application Number *(The Patent Office will fill in this part)* | 23 JUN 2004 0414067.9 |
| 3. | Full name, address and postcode of the or of each applicant *(underline all surnames)* | Dubois Limited<br>Amaray House, Arkwright Road<br>Corby, Northants. NN17 5AE<br>G.B. |
| | 07269467002<br>Patents ADP number *(if you know it)* | |
| | If the applicant is a corporate body, give the country/state of its incorporation | England and Wales |
| 4. | Title of the invention | PACKAGING ARTICLE |
| 5. | Name of you agent *(if you have one)* | Fry Heath & Spence LLP |
| | "Address for service" in the United Kingdom to which all correspondence should be sent *(including the postcode)* | The Gables<br>Massetts Road<br>Horley<br>Surrey RH6 7DQ |
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| Priority documents | 0 |
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11. I/We request grant of a patent on the basis of this application.

Signature(s) Date 23 June 2004

12. Name, daytime telephone number and e-mail address, if any, of person to contact in the United Kingdom: Anthony Clayton-Hathway – 01865 841060

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# Packaging Article

The present invention relates to beverage containers, and particularly relates to containers for supplying beverages to consumers. The invention has particular utility for the storage and supply of carbonated and other sparkling drinks, but at least some embodiments of the invention may also be suitable for use with other types of drinks.

For many years there has been a desire among drinks suppliers and container manufacturers to provide practical wide-mouth beverage supply containers which consumers may drink from comfortably in the same manner as from a drinks glass or other drinking vessel. Despite the tremendous advantages that such a beverage container would provide for drinks suppliers, container manufacturers and consumers alike, no successful beverage container that fulfils these aims has yet been produced. Consequently, bottles and ring-pull cans currently remain the main practical beverage supply containers for consumers. This is because there are significant technical problems associated with wide-mouth containers to overcome, and no practical solution to the problems has successfully been devised. The present invention aims to provide a practical beverage container.

United States Patent No. 5,725,115 discloses a closure cap that is connected to the neck of a container by a tether that is connected to a retaining ring secured to the container neck. The document discloses that such tether arrangements are known, for example so that the cap cannot be mislaid after the container has been opened. The document also discloses that with containers under pressure, such as is the case with beverages containing carbon dioxide, a screw threaded closure cap can be forced directly off the container mouth when the thread jumps. Because of the tether, however, the closure cap cannot fly off or will at least be restricted in its acceleration, even if the tether should tear. The risk of injury will thus be clearly reduced.

The present invention seeks to provide improved, practical, beverage containers especially (but not exclusively) for use with gas-pressurized beverages.

Accordingly, a first aspect of the present invention provides a beverage container for containing a gas-pressurized beverage, comprising a container body including an opening, a cap to close the opening, and a tether by which the cap is directly or indirectly attachable to the container body, wherein the container includes venting means to allow venting of gas between the container body and the cap upon partial removal of the cap from the container body, and wherein the tether is arranged to prevent the cap from being ejected from the container body by the gas before the venting is completed.

A second aspect of the invention provides a beverage container comprising a container body including an opening, a cap to close the opening, and a plurality of tethers by which the cap is directly or indirectly attachable to the container body, the tethers being arranged to maintain the attachment of the cap to the container body upon partial removal of the cap therefrom.

A third aspect of the invention provides a beverage container comprising a container body including an opening, and a cap to close the opening by means of a threaded engagement between the cap and the container body, wherein a thread of the cap and/or the container body has a plurality of helix angles or is a bayonet thread, and wherein the container includes a tether by which the cap is directly or indirectly attachable to the container body.

A fourth aspect of the invention provides a beverage container comprising a container body including an opening, a cap to close the opening, a tether by which the cap is indirectly attachable to the container

body, and a retaining device directly attachable to the container body, to which the tether is attached, wherein the retaining device is removable from the container body by rotation with respect to the container body.

A fifth aspect of the invention provides closure means for a container, comprising a cap for closing the container, a band for attachment to the body of the container, and a plurality of substantially non-severable tethers interconnecting the cap and the band. The tethers may thus provide extendible resilience to the closure means.

It is to be understood that any feature of an aspect of the invention may be a feature of any other aspect of the invention.

The cap preferably is releasably securable to the container body, preferably by means of a threaded engagement with the container body (or by means of a threaded engagement with another component mountable on the container body). Consequently, the (or each) means of securement, of the container body and/or the cap, preferably is a thread. The threaded engagement may comprise a bayonet-style engagement. Preferably, however, the threaded engagement is a screw-threaded engagement. The term "thread" as used herein includes (at least in the broadest aspects of the invention) continuous and discontinuous threads, (e.g. continuous and discontinuous screw threads), and bayonet-style threads, for example. Threads used in relation to the invention may, for example, comprise a plurality of segments (each thread segment comprising a said securement means), in which case the thread may either be discontinuous, or it may be substantially continuous because the effect is that of a substantially continuous thread pattern. Additionally, one or more threads used in the invention may have a single helix angle, or a plurality of differing helix angles.

The opening of the container body preferably is a wide-mouth opening. By a "wide-mouth opening" is meant (at least in its broadest

sense) an opening of a size suitable for a person to drink from the container in the same manner as from a drinks glass or similar drinking vessel. That is, in its broadest sense, the wide-mouth opening of the container (for embodiments of the invention having a wide-mouth opening) generally renders the container suitable as a drinking vessel from which a beverage supplied in the container may be conveniently drunk (in contrast to conventional narrow-necked bottles and ring-pull cans which generally are not regarded as comfortable drinking vessels). In practice, this requirement means that the diameter of the wide-mouth opening of the container will normally need to be at least 40mm, preferably at least 45mm, and more preferably at least 50mm. Additionally, an excessively wide opening is generally difficult for the consumer to drink from, and thus the wide-mouth opening preferably has a diameter no greater than 150mm, more preferably no greater than 100mm, and especially no greater than 80mm. A particularly preferred diameter range for the wide-mouth opening is 50 to 80mm, and examples of particular preferred diameters included 53mm and 63mm.

The container body preferably has no thread or thread segments on its exterior. Consequently, the container body preferably is comfortable for a consumer to drink directly from the container body.

A wide variety of thread forms for securing the cap to the container body is possible. As indicated at the beginning of this specification, at least some embodiments of the invention are intended for the storage and supply of carbonated and other sparkling drinks, for example beers, ciders, sparkling wines (including champagne), other fizzy alcoholic beverages, and non-alcoholic fizzy and sparkling beverages, including sparkling water and carbonated soft drinks. For such beverages, it is preferred for the engagement between the cap and the container body to include provision for gas venting upon partial removal of the cap from the container body, to prevent so-called "missiling" of the cap whereby the

cap is violently ejected from the container body as the container is opened, by the gas pressure of the contents of the container.

Preferably the cap and the container body are constructed and arranged to provide a vent for venting gas from the container body at least when the cap is in an intermediate position (between fully secured and fully released).

In some embodiments of the invention, the cap may include tamper-evident means (e.g. a tamper-evident band). Preferably the tamper-evident means comprises a retaining device as referred to above. Preferably the tamper-evident means is removed from the container body by the act of removal of the cap from the container body. Advantageously, the tamper-evident means may include means to prevent the cap from accidentally unscrewing from the container body under the influence of pressurization within the container (e.g. due to a pressurized beverage held in the container).

Preferably there is a plurality of severable webs interconnecting the retaining device (e.g. a tamper-evident band or other tamper-evident means) and the cap. Such webs preferably extend directly between the cap and the retaining device (until they are severed in use, e.g. by twisting the cap relative to the retaining device). However, in some embodiments of the invention, at least some of the severable webs may extend between the cap and one or more tethers and/or between one or more tethers and the retaining device. Additionally or alternatively, severable webs may extend between tethers. Thus, the tethers may be retained in a generally circumferential orientation by means of severable webs until the webs are severed (e.g. by twisting the cap) whereupon the tethers may be able to adopt a generally axial orientation.

In most embodiments of the invention, the cap and the tether(s) (and, where present, the retaining device – e.g. a tamper-evident band)

are located on the exterior of the container body. (The cap may also include a bore seal, for example, which extends into the interior of the container body.) Thus, if there is a threaded engagement between the cap and the container body, this may be provided between an external surface of the container body and an internal surface of the cap (e.g. a skirt portion of the cap). If a tamper-evident band or other retaining device is present, this may be provided on an external surface of the container body.

However, in some embodiments of the invention, the engagement between the cap and the container body may be an engagement between an external surface of the cap (e.g. a bore seal or other plug portion of the cap) and an internal surface of the container body. In such embodiments, the tether(s) and (where present) a retaining device (e.g. tamper-evident band) may still be located on the exterior of the container body. Alternatively, however, the tether(s) (and, where present, a retaining device) may be located inside the container body, at least when the cap is secured to the container body. For example, the tether(s) may extend from a bore seal or other plug portion of the cap (i.e. a portion that extends into the bore of the container body).

In some particular embodiments of the invention, the tether(s) may interconnect the cap with a sealing member provided inside the container body. Such a sealing member may, for example, be in the form of a sealing platform, sealing membrane or other seal (e.g. a foil seal as described below) extending across the bore of the container body to seal the container. An advantage of this arrangement is that, for example, the cap may be unscrewed from the container body while the seal remains substantially unaffected by the unscrewing action, and the seal may then be peeled off (or otherwise removed or opened) by pulling the cap and the tether(s) in a direction away from the container body. Thus, the presence (and particularly the flexibility) of the tether(s) effectively "de-couples" the cap from the seal, while enabling the seal to be removed by means of

the cap. In order to facilitate the removal or opening of the seal by means of the cap and tethers, a plurality of tethers of differing lengths may be provided, such that the pulling action on the seal is initiated at one point (or more than one point) before other points, thereby initiating the peeling action on the seal at that point.

Embodiments of the invention preferably include sealing means to seal the container. Such sealing means may comprise part of the cap and/or the container body and/or a separate component, for example. Preferred sealing means include sealing flanges and/or other sealing members, for example gaskets and the like. Another possible sealing member is a metal foil seal (e.g. formed from aluminium foil), which may optionally be provided with one or more polymer layers on one or both major surfaces thereof. The foil seal may provide an excellent gas barrier, for example. Advantageously, the use of a metal foil seal may enable the formation of a seal by induction heating, e.g. by bonding one or more polymer layers to the container body and/or to the cap. The foil seal may be provided on the cap and/or the container body and/or separately.

The container and its components may be made from any suitable material, including metal and/or glass and/or polymer material. Polymer materials are generally preferred for the cap, especially polyolefins, e.g. polyethylene or polypropylene. The container body preferably is formed from glass or polymer material, especially a polyolefin, e.g. polyethylene terephthalate (PET). The polymeric components preferably are formed by moulding, especially injection moulding and/or blow moulding.

Two preferred embodiments of the invention will now be described, by way of example, with reference to the accompanying drawings, of which:

Figure 1 (views (a) to (c)) shows a process of opening a container according to a first embodiment of the invention;

Figure 2 shows a detail of the container body of the first embodiment of the invention;

Figure 3 (views (a) to (c)) shows a container according to a second embodiment of the invention; and

Figure 4 shows a detail of a container according to a third embodiment of the invention.

Figure 1 shows a beverage container 1 for containing a gas-pressurized beverage, comprising a container body 3 including a wide-mouth opening 4, a cap 5 to close the opening, a tether 7 by which the cap is indirectly attachable to the container body, and a retaining device 9 in the form of a tamper-evident band that is directly attachable to the container body. The cap 5 is arranged to close the wide-mouth opening 4 by means of a threaded engagement with the container body 3. In particular, the container body 3 includes a screw thread 11 on its internal surface (rather than the external surface), and a plug portion 13 of the cap 5 includes a screw thread 15 on its external surface (rather than on an internal surface of a skirt portion of the cap). Consequently, the exterior of the container body is free from screw threads and thus presents a consumer-friendly vessel from which consumers may comfortably drink the beverage supplied in the container.

Adjacent to the wide-mouth opening 4 of the container body 3 is a radially-outwardly projecting rim 17 of the container body. When the beverage-containing container is supplied to the consumer, the cap 5 and tamper-evident band 9 are secured to the container body, with the cap fully engaged to the container body by means of its threaded engagement, and the tamper-evident band trapped beneath the rim 17 on the exterior of the container body. In this closed configuration, which is shown in Figure 1(a), a sealing leading-edge 19 of the plug portion forms

a seal with a corresponding sealing surface 21 provided on the interior of the container body. Consequently, the container is tightly sealed by its cap 5. The tamper-evident band 9 is connected to the cap 5 via severable webs 23, and via at least one substantially non-severable tether 7. The (or each) tether 7 is flexible, and has a greater length than each of the webs 23. The tether is in a generally "diagonal" configuration before the webs are severed, when the cap is fully engaged with the container body, as indicated in Figure 1(a). The diagonal configuration is due to the opposite ends of the tether, respectively where it joins the cap and the tamper-evident band, being off-set (i.e. out of alignment) with respect to each other. This is to allow relative movement between the cap and the tamper-evident band in the direction in which the cap is to be unscrewed (to open the container).

Figure 1(b) shows the container after an initial unscrewing movement of the cap 5 has been effected, sufficient merely to sever the webs 23 between the cap and the tamper-evident band 9. Consequently, this initial unscrewing movement is sufficient to provide tamper-evidence. The amount of unscrewing movement is indicated in the figure by the movement of the thread segment 11 of the container body, with respect to the screw thread of the cap. Because of the (small) relative movement between the cap and the tamper-evident band 9, the tether 7 is now in a "folded" configuration, because the opposite ends of the tether are in approximate alignment with each other, but the cap has yet to move axially with respect to the tamper-evident band. The cap has not moved axially because this initial movement of the cap is defined by a first region A of the thread 15 of the cap, which has a substantially horizontal orientation, i.e. a helix angle of substantially zero degrees.

The tamper-evident band 9 has been held in place on the circumference of the container body 3 while the cap 5 has been rotated with respect to the container body and the tamper-evident band, because a radially-inwardly directed protrusion 25 of the tamper-evident band is

located with a radially-outwardly directed stop feature 27 provided on the exterior surface of the container body below the rim 17. This is indicated in the top view of Figure 1(a), which is a cross-sectional view of the container body on a horizontal cross-sectional plane through the container body immediately below the rim 17. The stop feature 27 is also shown in Figure 2, which illustrates a detail of the upper region of the container body 3 of this embodiment of the invention. An optional ratchet feature 28 may be provided, to prevent the tamper-evident band rotating away from the stop feature 27.

Once the components of the container are arranged in the configuration shown in the side view and the side cross-sectional view of Figure 1(b), with the tether 7 in its folded configuration, the resilience of the tether then pushes the tamper-evident band 9 downwardly, away from the cap and the rim 17. The relative dimensions of the stop feature 27 and the tether 7 are chosen such that this downward movement of the tamper-evident band moves the tamper-evident band clear of the stop feature (i.e. below it). Consequently, the cap and the tamper-evident band are now able to rotate together upon further unscrewing of the cap from the container body. The top view of Figure 1(b) actually shows the configuration after the tamper-evident band has moved clear of the stop feature and has rotated slightly with respect to the container body, such that the protrusion 25 now lies on the opposite side of the stop feature 27.

Once the configuration shown in Figure 1(b) has been reached, the cap 5 is forced away from the container body 3 and the tamper-evident band 9, along a second region B of the thread 15 of the cap. This second region B of the thread 15 of the cap has a steep helix angle, for example in the range 30-90 degrees (e.g. approximately 45 degrees as drawn). The cap 5 is forced along this second region of the thread by the gas-pressurization of the beverage contained in the container, and the cap is prevented from being ejected from the container body by the tether 7 and

the tamper-evident band 9. The tamper evident band 9 is retained on the container body 3 by the rim 17, and thus the cap 5 is indirectly retained on the container body by the tether 7, which is attached to the tamper-evident band. The length of the tether 7 is such that at the maximum extension of the tether, as shown in the middle view of Figure 1(c), gas from the interior of the container is able to vent between the container body and the cap, via the wide-mouth 4 of the container.

Once the gas from the interior of the container 1 has safely vented to the atmosphere without the cap 5 being ejected forcefully from the container body, the cap can be unscrewed further, such that the thread segments 11 on the interior of the container body move along respective third regions C of the thread 15 of the cap. The third regions C have a substantially zero helix angle, similarly to the first regions A. (In some embodiments, the third regions C may be omitted, such that the thread 15 of the cap comprises only first and second regions A and B. In such embodiments, the cap is retained on the container body during venting only by the tamper-evident band and the tether(s).) Because the protrusion 25 on the tamper-evident band is now clear of the stop feature 27, the tamper-evident band 9 rotates with the cap 5. This rotation of the tamper-evident band 9 causes the protrusion 25 to be forced along a ramp-shaped "lead-out" profile 29 arranged to bring the protrusion into radial alignment with the radially outer surface of the rim 17. (The ramp-shaped profile 29 is shown in Figure 2.) Consequently, the tamper-evident band 9 can now be released from the container body 3 together with the cap 5. The removal of the cap 5 and the tamper-evident band 9 from the container body allows the consumer to drink the beverage directly from the container body via its wide-mouth 4.

Figure 3 (views (a) to (c)) shows a container 1 according to a second embodiment of the invention. (In Figure 3, items similar to respective items of the embodiment shown in figures 1 and 2 have the corresponding reference numerals.) Figure 3(a) shows a cap 5 and

tamper-evident band 9 in the process of being engaged with a container body 3, in order to close and seal a wide-mouth opening 4 of the container body. This embodiment of the invention is similar to that shown in figures 1 and 2, with the following main exceptions.

Firstly, instead of the under-rim profile, including the stop feature 27 and the ramp-shaped profile 29 as shown in Figure 2, this embodiment includes a plurality of ribs 31 provided immediately below the container body rim 17 and arranged spaced-apart around the exterior circumference of the container body. As shown in view (c), the tamper-evident band 9 includes a plurality of correspondingly spaced-apart inwardly-directed ramp-shaped ratchet teeth 33, which allow the rotation of the tamper-evident band with respect to the container body in the screwing-on (clockwise) direction, but which prevent such rotation in the unscrewing (anticlockwise) direction by engagement with respective ribs 31 on the container body.

Secondly, the tamper-evident band 9 includes a tab 35 forming part of a tear strip of the band, by which the band may be torn away from the container body 3 by the consumer, as described below. A corresponding recess 37 is provided in the cap 5, to facilitate gripping of the tab 35 by the consumer.

Thirdly, the top edge of the tamper-evident band 9, adjacent to the cap 5, is provided with ramp-shaped projections 39, and the cap 5 is provided with corresponding ramp-shaped indentations with which the projections 39 engage.

Fourthly, the thread 15 on the plug portion 13 of the cap has a single non-zero helix angle.

The functioning of the Figure 3 embodiment of the invention will now be described. As indicated in view (a), the cap 5 and attached

tamper-evident band 9 are screwed into the wide-mouth 4 of the container body 3. This is made possible by the radially inwardly-directed ratchet teeth 33 of the tamper-evident band being able to pass over the ribs 31 provided immediately below the rim 17 of the container body 3. As the tamper-evident band 9 passes over the rim 17, the tab 35 is folded upwardly, between the band 9 and the rim 17, such that an end of the tab is situated behind the recess 37 in the cap 5. The tamper-evident band 9 is attached to the cap by severable webs 23, and by longer, substantially non-severable tethers 7. Additionally, the ramp-shaped projections 39 are located in the corresponding indentations or recesses in the cap 5. Consequently, the tamper-evident band 9 and the cap 5 are firmly rotationally connected to each other, such that by screwing the cap into the wide-mouth opening, the tamper-evident band is also rotated, without severing the webs 23 between the cap and the band.

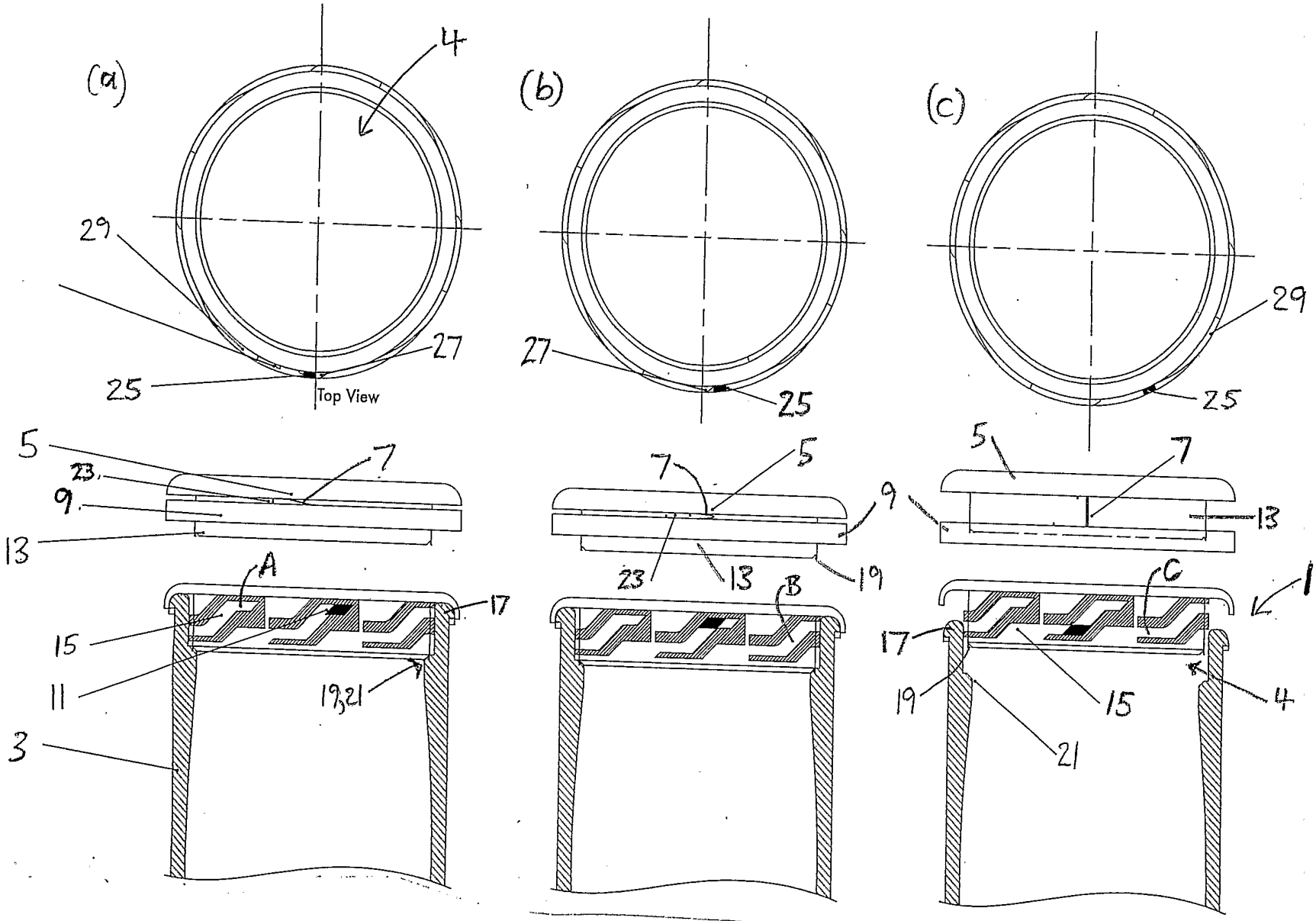
Additionally, once fully engaged to the container body 3, the cap 5 is prevented from unscrewing under the influence of the gas-pressurization of the beverage held in the container, by the ribs 31 engaged by the ratchet teeth 33 of the tamper-evident band, which is engaged by the cap 5 via the projections 39 (and also via the webs 23). The ramp-shape of the projections 39 and their corresponding indentations in the cap 5 (together with the engaging screw threads) in fact provide an opposing force to at least partially oppose any such unscrewing force caused by the gas-pressurization.

In order to open the container in use, the consumer twists the cap 5 in an unscrewing (anticlockwise) direction with respect to the container body 3. Assisted by the cooperation between the ramp-shaped projections 39 on the tamper-evident band 9 and their corresponding indentations in the cap 5, this twisting action causes a vertical movement of the cap with respect to the band 9, thereby breaking the webs 23, as shown in Figure 3(c). However, the cap 5 is still connected to the tamper-evident band 9 via the tethers 7, and the band 9 is still attached to the

container body 3 by the ratchet teeth 33 trapped under the rim 17. Consequently, the pressurized gas of the beverage contained in the container body is able to vent safely to the atmosphere (between the cap 5 and the container body 3) without causing the cap to be ejected forcefully from the container body. Once such venting has occurred, the consumer pulls the tab 35, thereby tearing the tamper-evident band 9, and thus releasing the band 9 and the cap 5 from the container body 3. The consumer is then able to consume the beverage by drinking it directly from the wide-mouth 4 of the container body, if he or she so desires.

Figure 4 shows a detail of a container according to a third embodiment of the invention, which is similar to the embodiment shown in Figure 1. The main difference between the Figure 4 and the Figure 1 embodiments is the use of a seal 41 in the form of a sealing platform or membrane that is intended to be located inside the container body 3 such that it extends across the internal bore of the container body, thereby sealing the container. In particular, the seal 41 is arranged to be located between the plug portion 13 of the cap 5, and the sealing surface 21 (see Figure 1) situated inside the container body.

Fig. 1



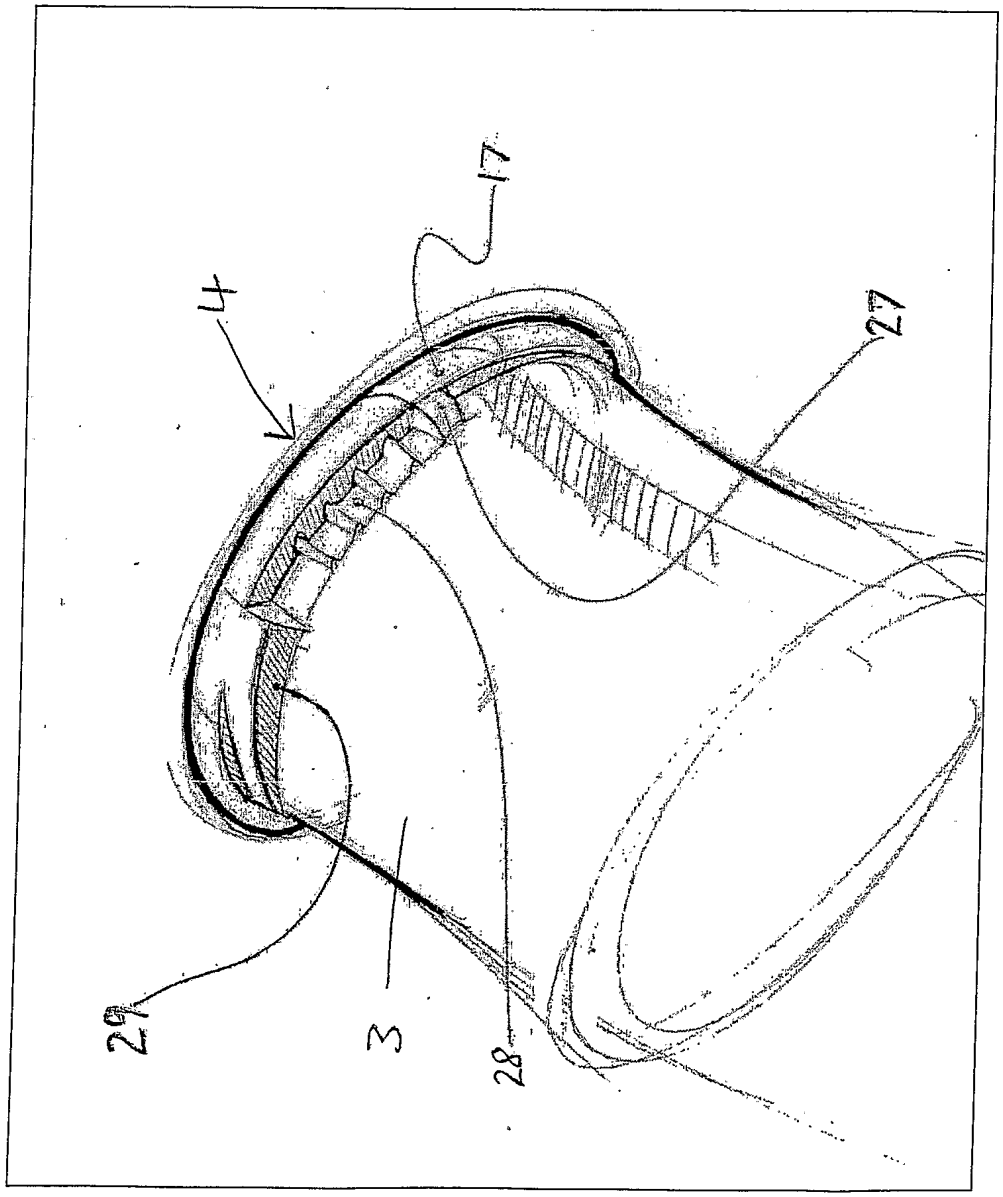
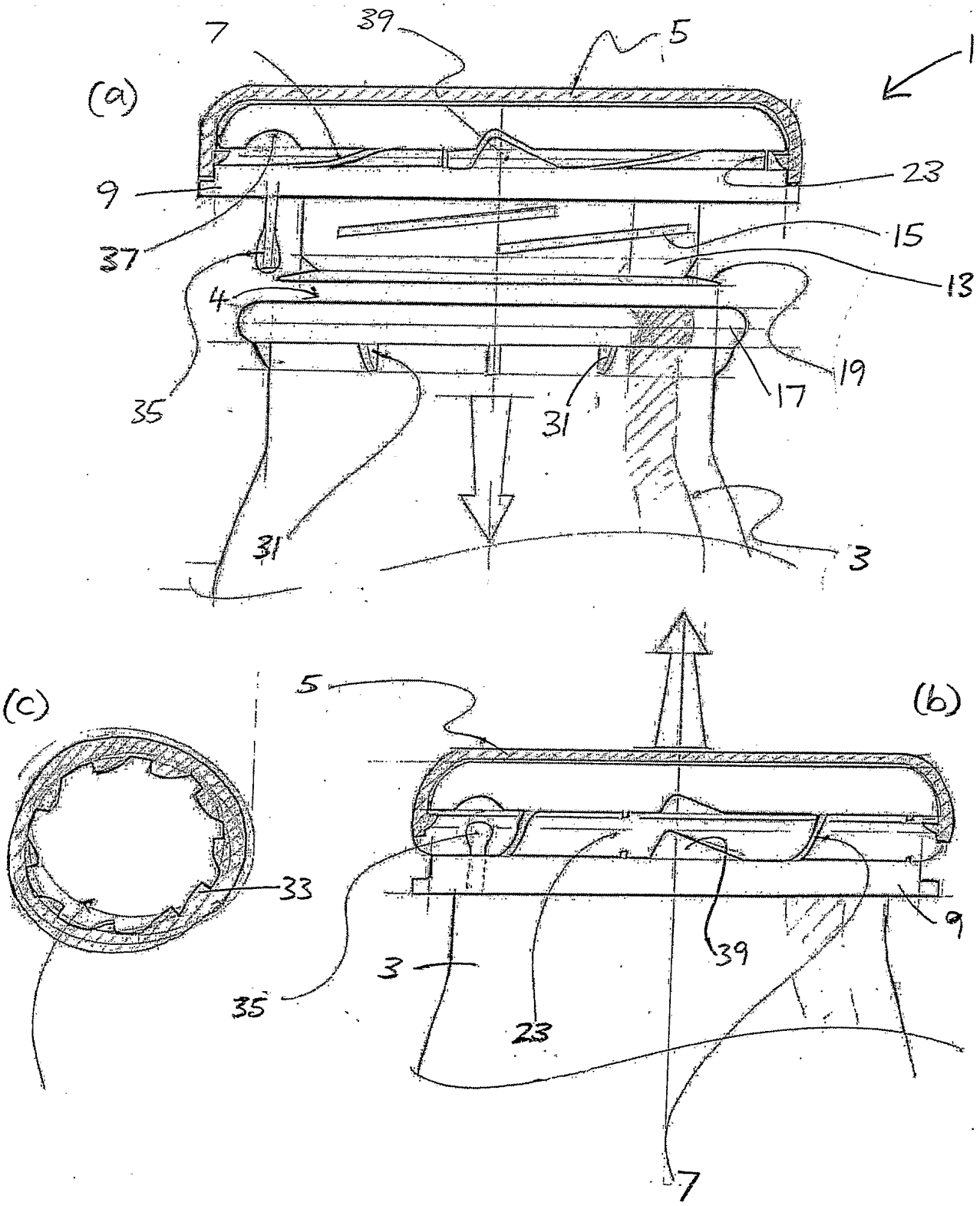



Fig. 2

Fig.3



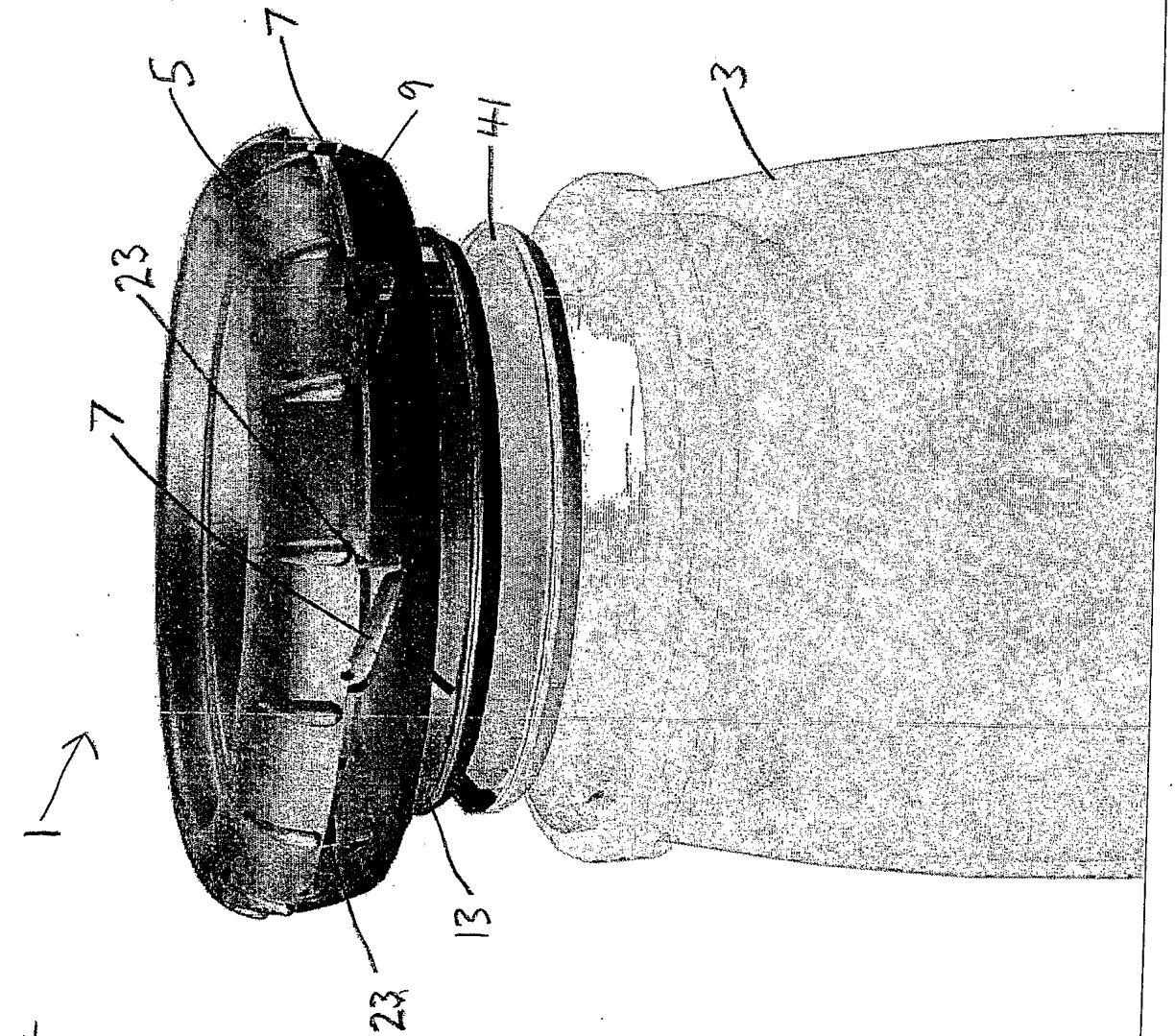



Fig.4